Simple calculation of the anistropic factor for minimum current path in MgB2 material using the extrapolated Kramer field as priori parameter.

ABSTRACT

The volume flux pinning force density of MgxB2 (x = 0.8, 1.0 and 1.2) materials was calculated for grains boundary and point pinning potentials. Stoichiometric Mg0.8, MgB2, and Mg 1.2B2 samples were prepared by the conventional solid state reaction method. Three pellets were annealed at temperature range of 650-800°C. Structural analysis revealed large values for FWHM at (hkl) (110)(°) which indicates distortion in the boron plane of these specimens. The a and c – axis lattice parameters showed respective contraction and elongation with the increase in processing temperature. The low crystallinity found in Mg0.8B2 and Mg1.2B2 specimens was concluded to be due to structural defects, which act as flux pinning centres. Experimental anisotropic factor and the minimum fraction for current path, obtained from the framework of current percolation theory were used to explain the strong field dependence of the critical current density, Jcin the specimens. The summit of the maximum pinning force density was shifted to lower magnetic field position with the increase of anisotropy. The scaling laws were employed in a Kramer– like field in order to identify the dominant pinning mechanism correspondence to the summit of maximum pinning. For MgB2 specimens however, a renormalization field based on the current percolation exposition is considered for the identification of their dominant pinning since it is very difficult to account for the flat behaviour of the pinning force in the weakened current region of these specimens.

Keyword: Anisotropy; Current percolation, Grain boundary pinning.